Construction Management Information System at JINR

Alejandro Rodríguez Alvarez (JINR-CEADEN).

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CONSTRUCTION MANAGEMENT INFORMATION SYSTEM AT JINR

C. Ceballos,[1,*]   A. A. Kolozhvari,[1] A. G. Dolbilov,[1] R. N. Semenov,[1] E. A. Tsapulina,[1]

A. Rodriguez,[1,2] A. D. Sheremetiev,[1] and Yu. A. Murin for the MPD-ITS Collaboration[1]

[1]*Joint Institue for Nuclear Research, Dubna, Russia*

[2]*Center for Technological Applications and Nuclear Development, Havana, Cuba.*

The commissioning of an all-around Construction Management information System (CMIS) was recently completed as a joint effort of two JINR Laboratories (LHEP and LIT). The system is particularly useful for the fine-grained control and continuous feedback of the production of complex multipart objects like the detectors subsystems composing the MPD and BM@N experiments of the NICA facility at LHEP. Currently, the CMIS is meant to be used to follow the production of silicon tracker detectors at the STS department of the LHEP at JINR, although it would as well be used by any other hardware production projects related to JINR whose complexity would make it very hard to fulfilling its quality and timing requirements otherwise.

1. INTRODUCTION

Two of the major experiments of the NICA collider project at JINR are the MultiPurpose Detector (MPD) [1] and the Baryonic Matter at Nucleotron (BM@N) [2]. In both cases the production of the silicon tracker of this facilities will be led by the STS department of the LHEP at JINR under the project names of MPD-ITS and BM@N-STS, respectively. These are complex setups that require the implementation of a precise workflow of components production, multi-stage assembly and test to be coordinated between several institutions [3, 4]. For this reason it was decided to implement for both projects a construction management information system (CMIS) that would allow for a tight control of the production process for the timely achievement of both projects goals. The system contains a Web application installed on an application server that is accessed by the clients through the internet and

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* Electronic address: ceballos@jinr.ru

Construction Management Information System

Customer	Joint Institute for Nuclear Research 6 Joliot-Curie St Dubna Moscow Region Russia
Contact person	Yuri Murin
Date	11. 11. 2019
Authors	Ján Jadlovský Henrieta Telepovska Jakub Čerkala Vasiľ Vančik

All-around multiple-projects handler.

It is composed of the following base modules:

- » **Resources Module**
  - » Members
  - » Institutes
- » **Project Module**
  - » Project Definition and Planning
  - » Project Management and Resources
  - » Construction Data
  - » Activities
  - » Finances
  - » Reports
- » **Administration**
- » **Help**

Information System for ALICE Upgrade
Construction Management System

ALICE UPGRADE CONSTRUCTION
MANAGEMENT SYSTEM

January 2019

Ver. 3

CERN

KYBERNETIKA, s.r.o., Košice

Orgovánová 4

040 11 Košice

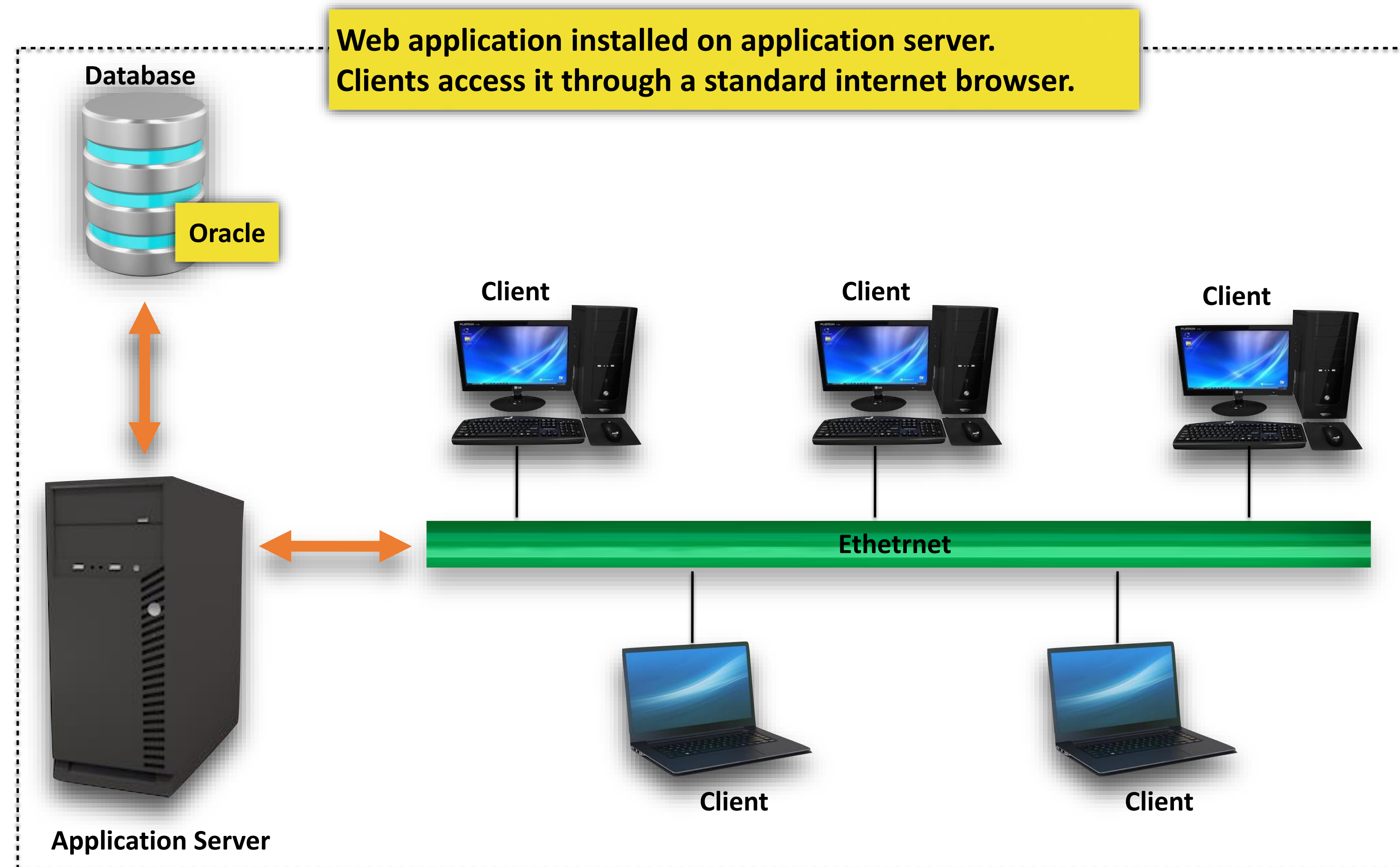Slovak republic

KYBERNETIKA s.r.o.
Automatizované systémy riadenia

Construction Management Information System

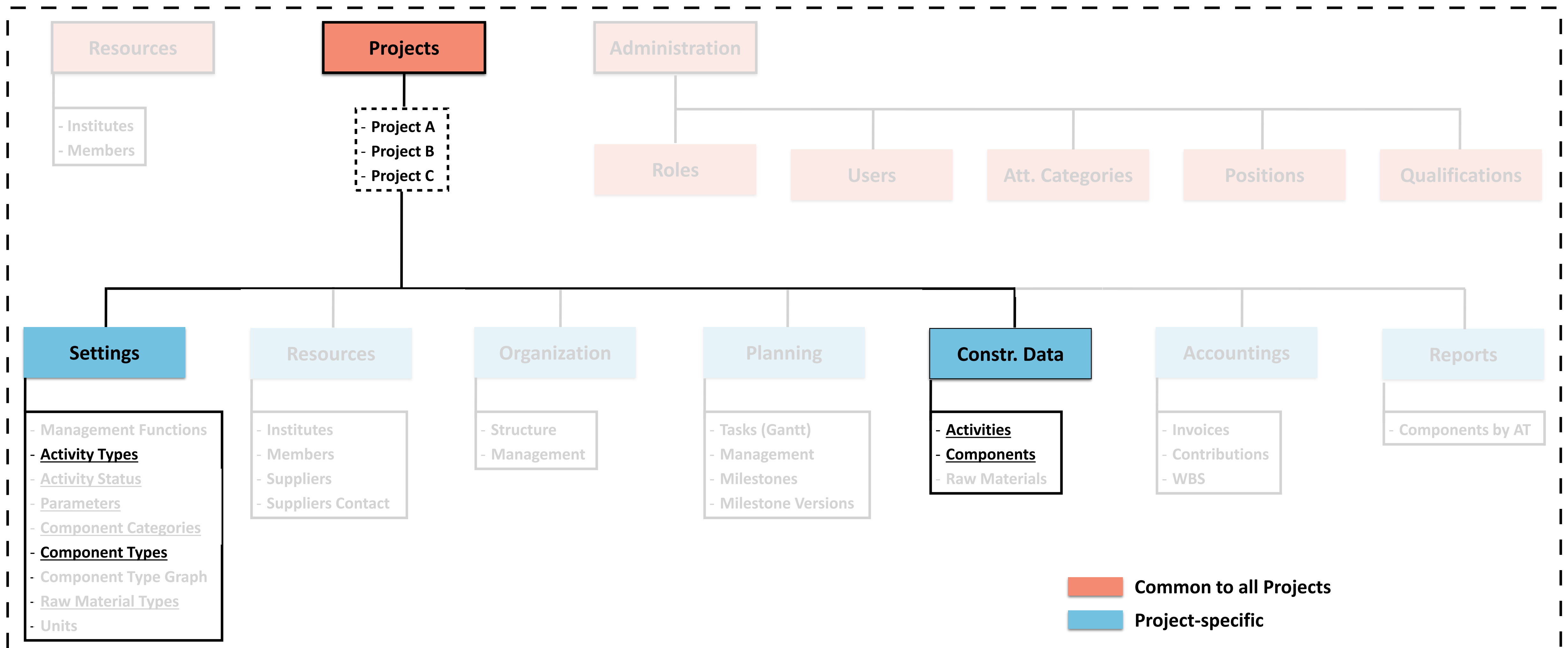| Customer	Joint Institute for Nuclear Research 6 Joliot-Curie St Dubna Moscow Region Russia
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CMIS by Kybernetika

KYBERNETIKA s.r.o.
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Web application installed on application server.
Clients access it through a standard internet browser.

Database

Oracle

Client

Client

Client

Ethetrnet

Application Server

Client

Client

CMIS full structure

Resources
- Institutes
- Members

Projects
- Project A
- Project B
- Project C

Administration

Roles

Users

Att. Categories

Positions

Qualifications

Settings
- Management Functions
- Activity Types
- Activity Status
- Parameters
- Component Categories
- Component Types
- Component Type Graph
- Raw Material Types
- Units

Resources
- Institutes
- Members
- Suppliers
- Suppliers Contact

Organization
- Structure
- Management

Planning
- Tasks (Gantt)
- Milestones
- Milestone Versions

Constr. Data
- Activities
- Components
- Raw Materials

Accountings
- Invoices
- Contributions
- WBS

Reports
- Components by AT

Common to all Projects

Project-specific

'Settings' & 'Construction Data'

Activities and Components

Activities are actions performed on Components that may change their
Physical/Functional(*) status.
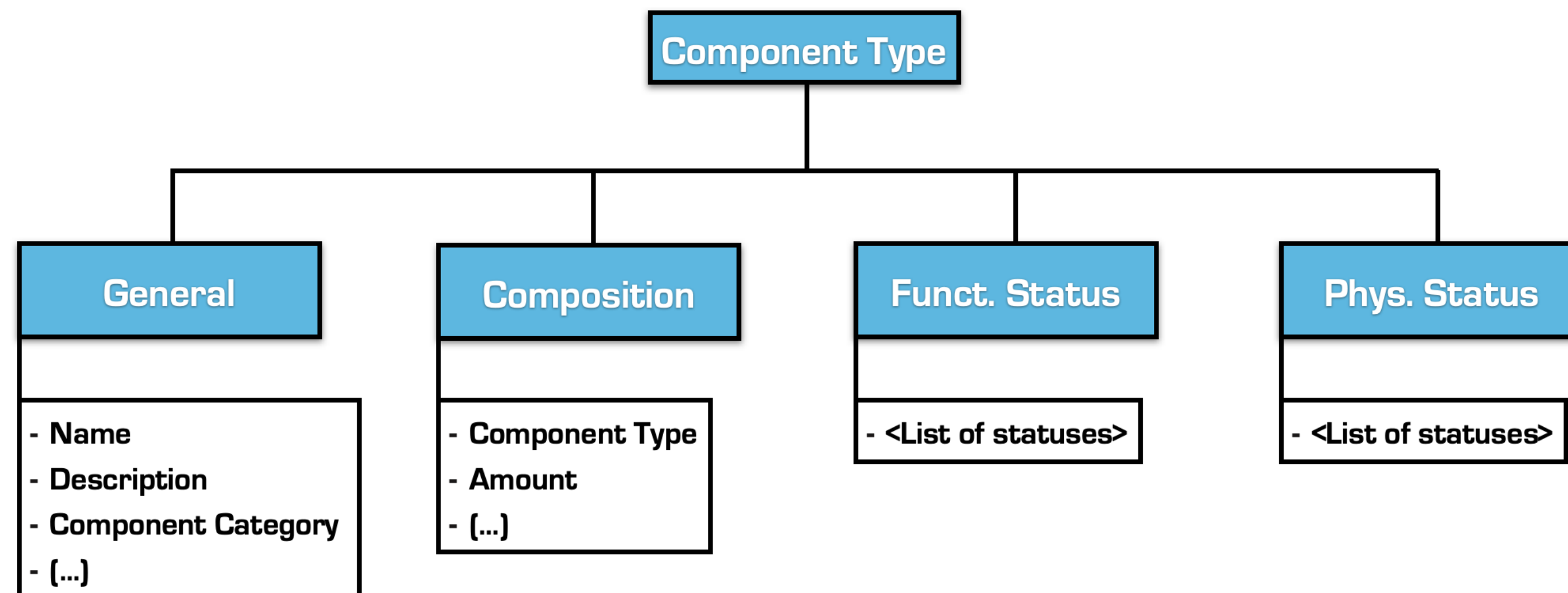
Activity: MAPS Chip Classification of ChipXX

Component: MAPS ChipXX

(*) All possible Physical and Functional statuses of a component are declared on the
'Component Type' definition.
The possible result of an Activity are combinations of Physical and functional statuses and
are declared on the 'Activity Type' definition.

Result: MAPS ChipXX [Physical Satus] = <physical_status_value>
MAPS ChipXX [Functional Satus] = <functional_status_value>

Component Types and Activity Types main structure

Component Type

General
- Name
- Description
- Component Category
- (...)

Composition
- Component Type
- Amount
- (...)

Funct. Status
- <List of statuses>

Phys. Status
- <List of statuses>

Activity Type

General
- Name
- Description

Output Comp. Types
- Component Type
- Amount
- Unit
- (...)

Input Comp. Types
- Component Type
- Amount
- Unit
- (...)

Parameters
- Parameters
- Unit

Location
- <List of Locations>

Material Conformity
- Component Type
- Physical Status
- Functional Status

Activity Status
- <List of Statuses>

Activity Result
- <List of possible results based on Funct. & Phys. statuses combinations>

CMIS implementation at JINR (LIT)

Interlaboratory Collaboration

LIT

CMIS

File

(Oracle)

attachments

EOS

Custom Assembly & Testing programs

Direct HW interface to DB
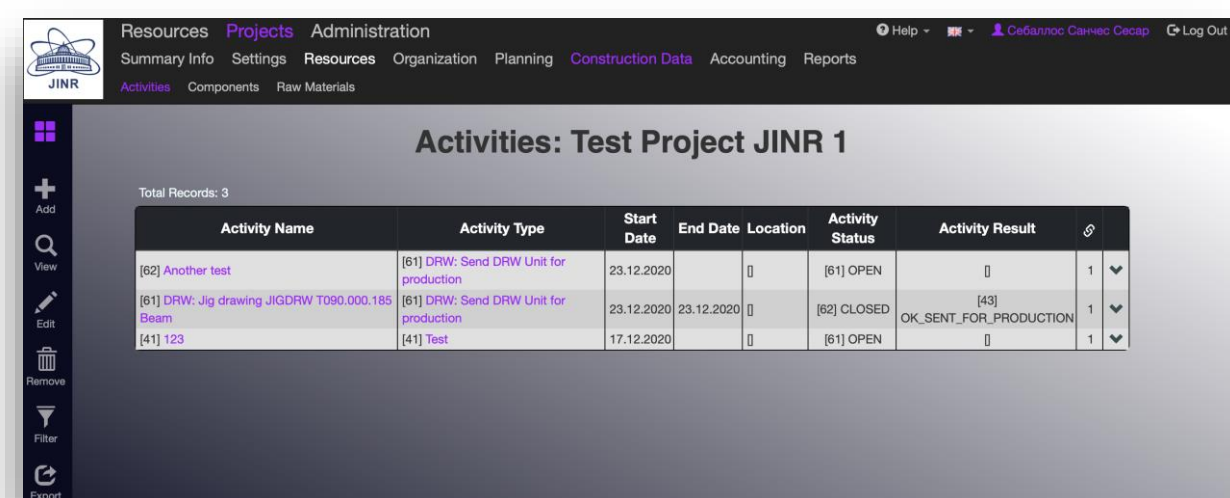
webAp
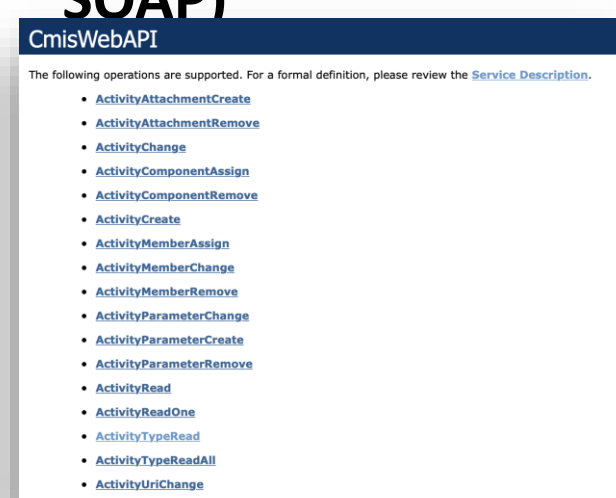
API

(HTTP GET/POST & functions SOAP)

p(HTTPS)

(SSH)

(SSO cookie)

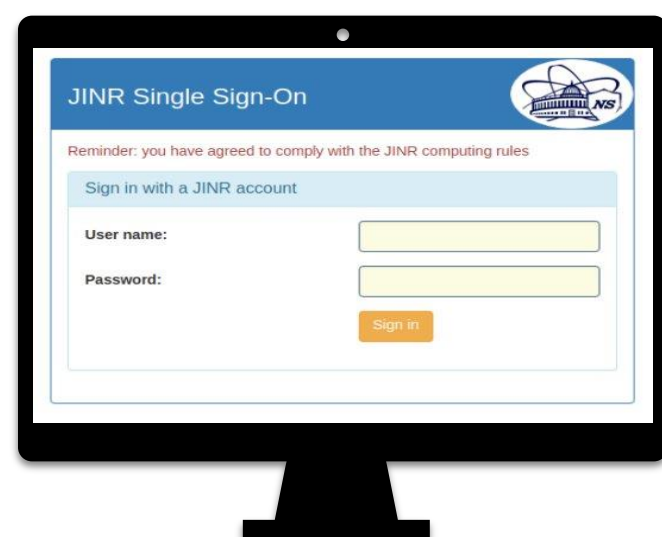(Kerberos credentials automatically renewed)
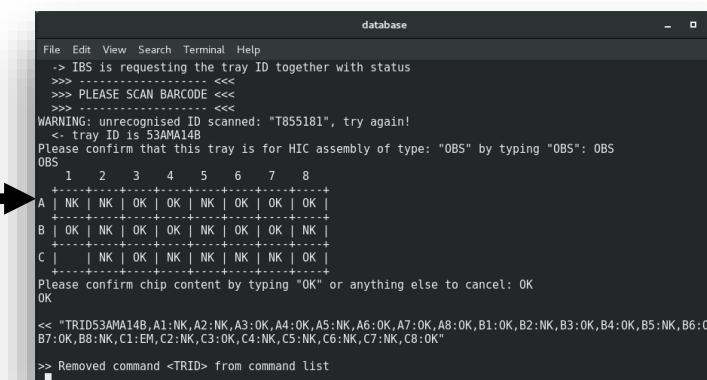
JINR SSO:

» **Registered service accounts.**

» **Kerberos credentials.**
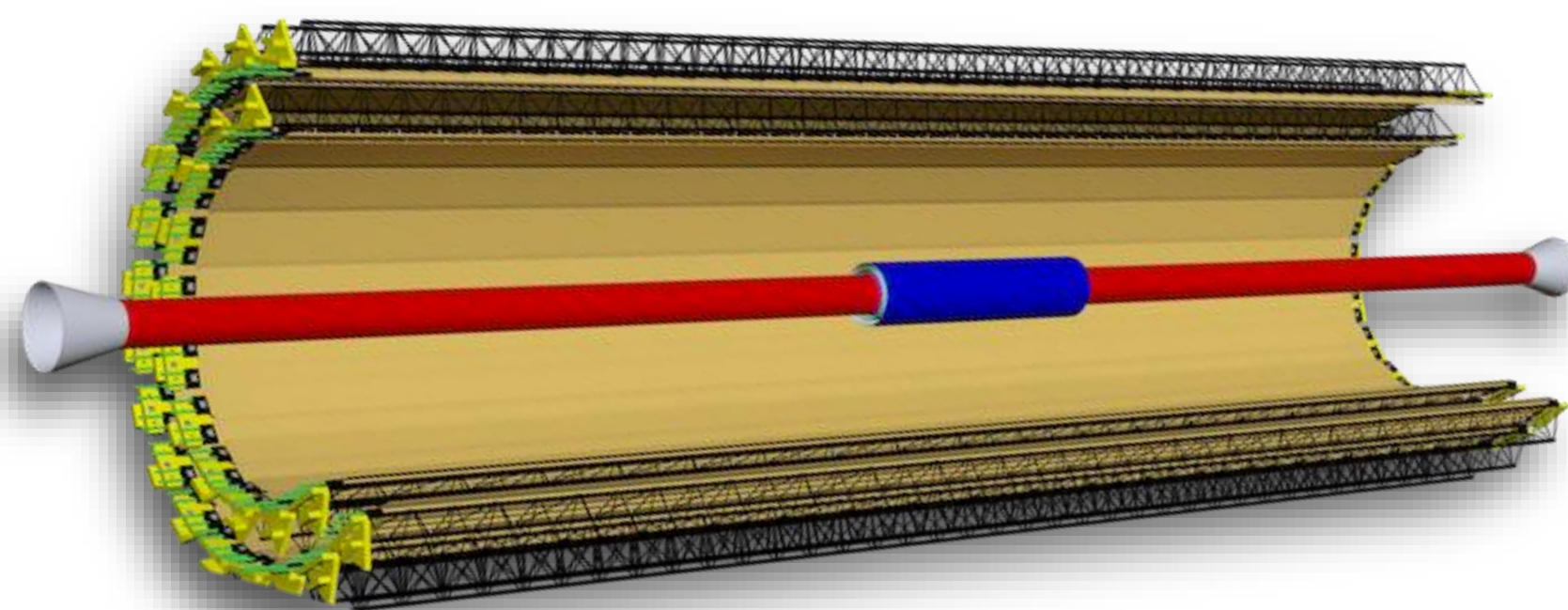
» **Access cookies acquired through 'get-sso-cookie.py'.**
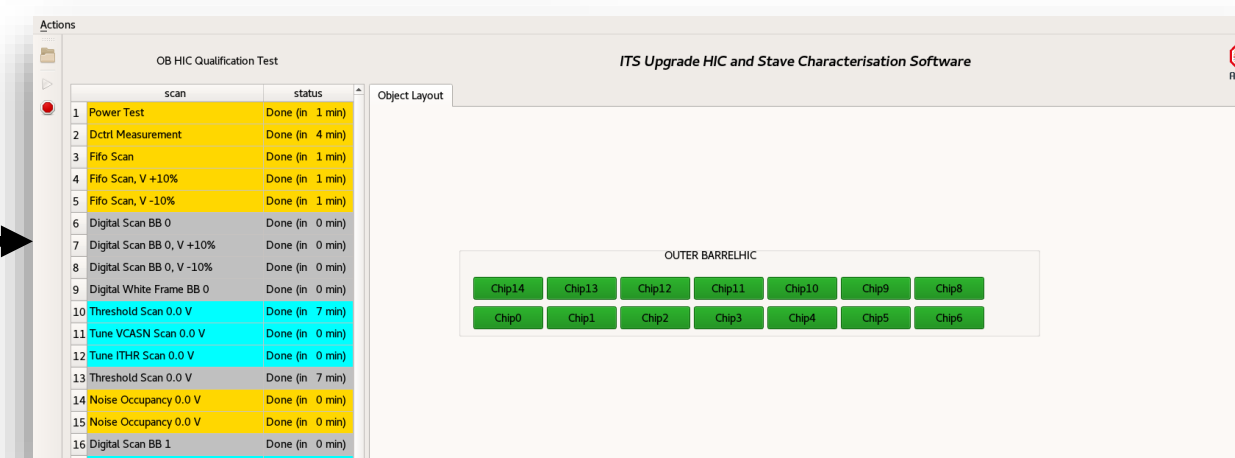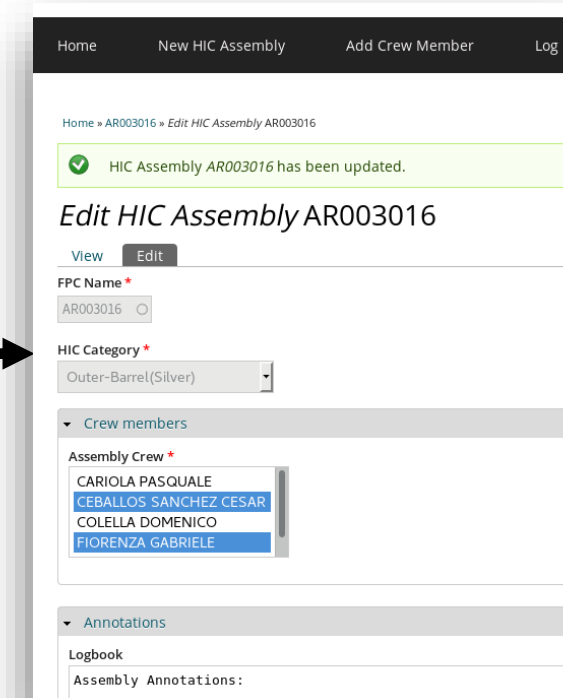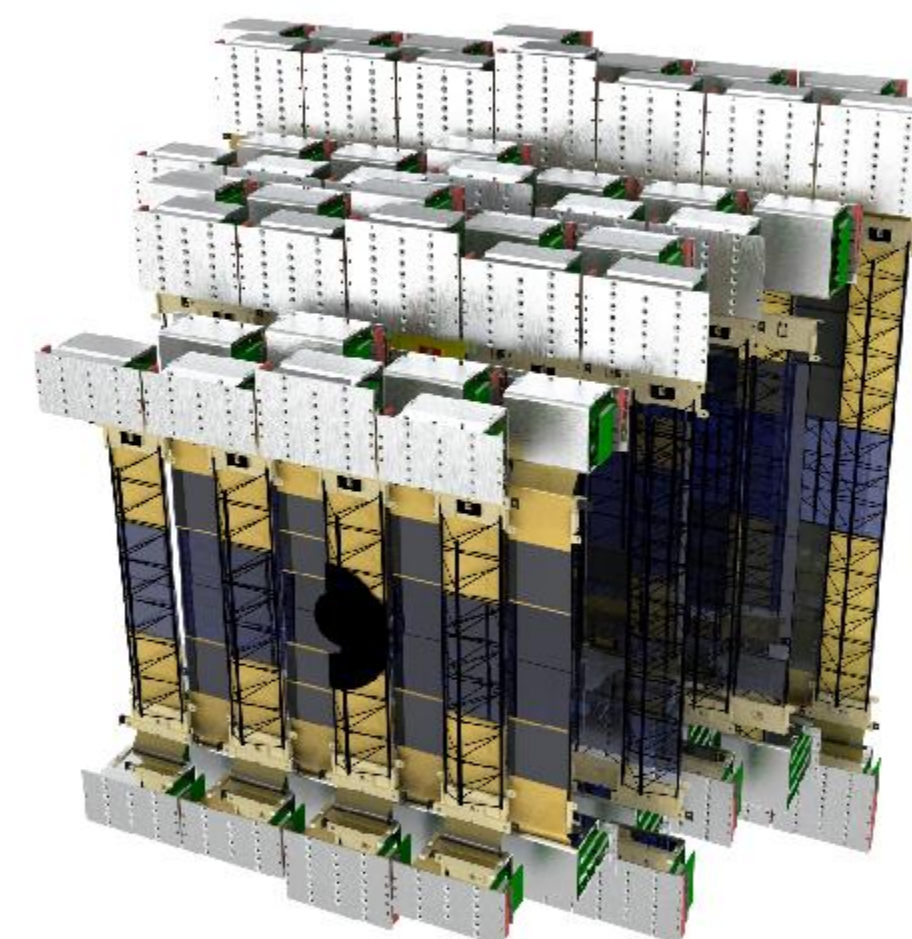
JINR SSO:

» **Web access.**

» **Registered JINR-SSO users.**
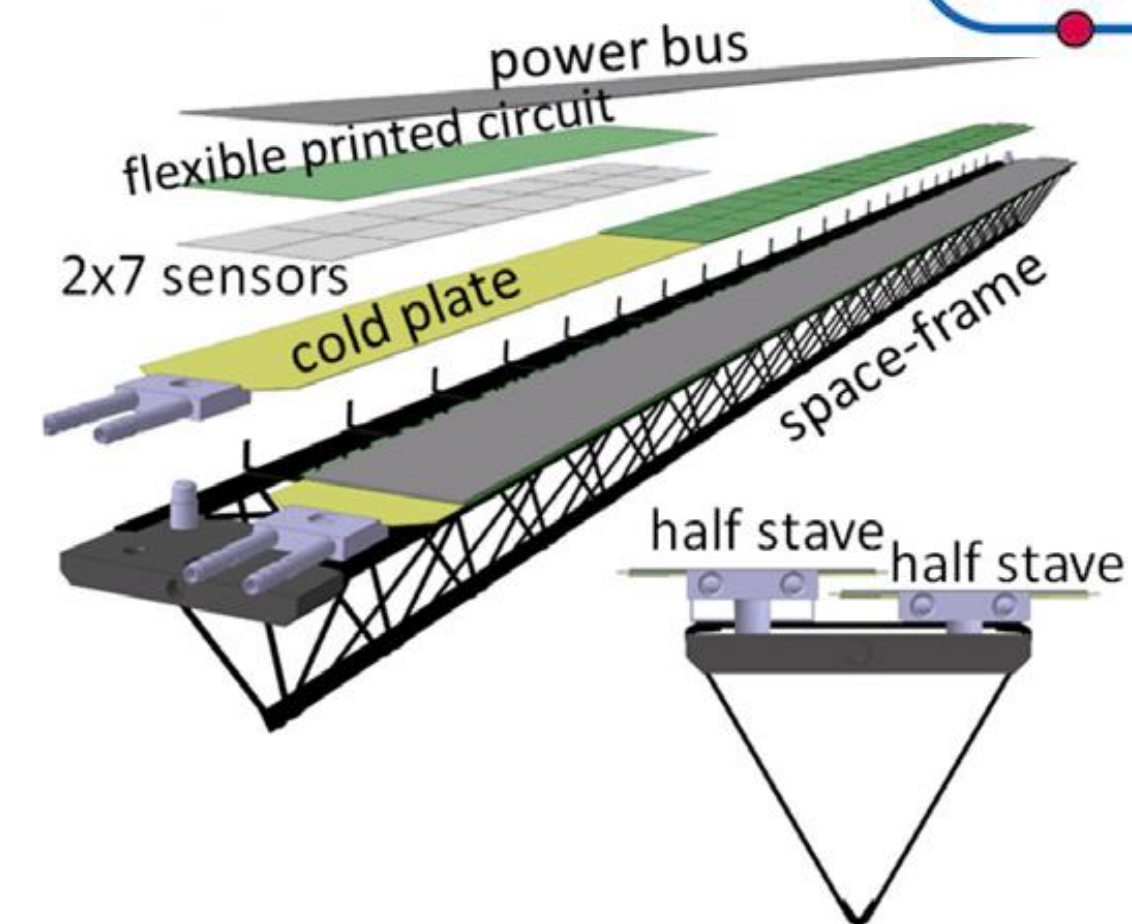
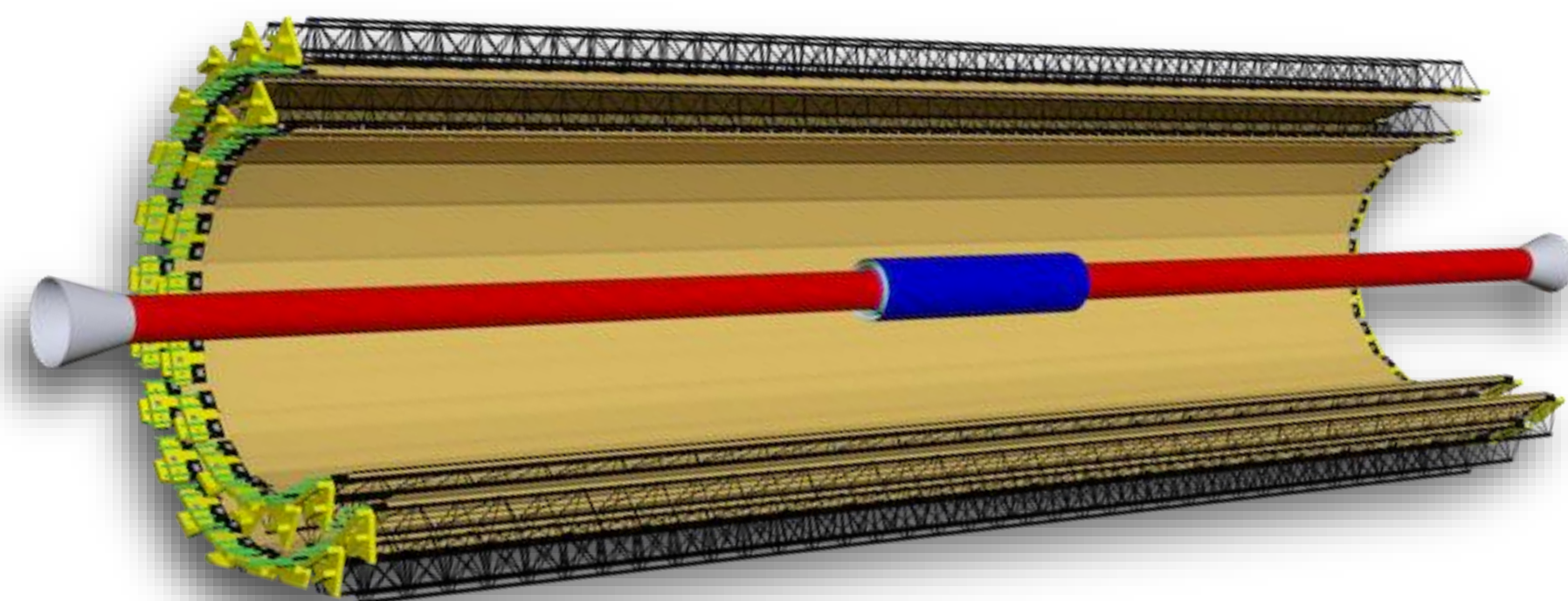» **Role-based access rights.**

MPD-ITS
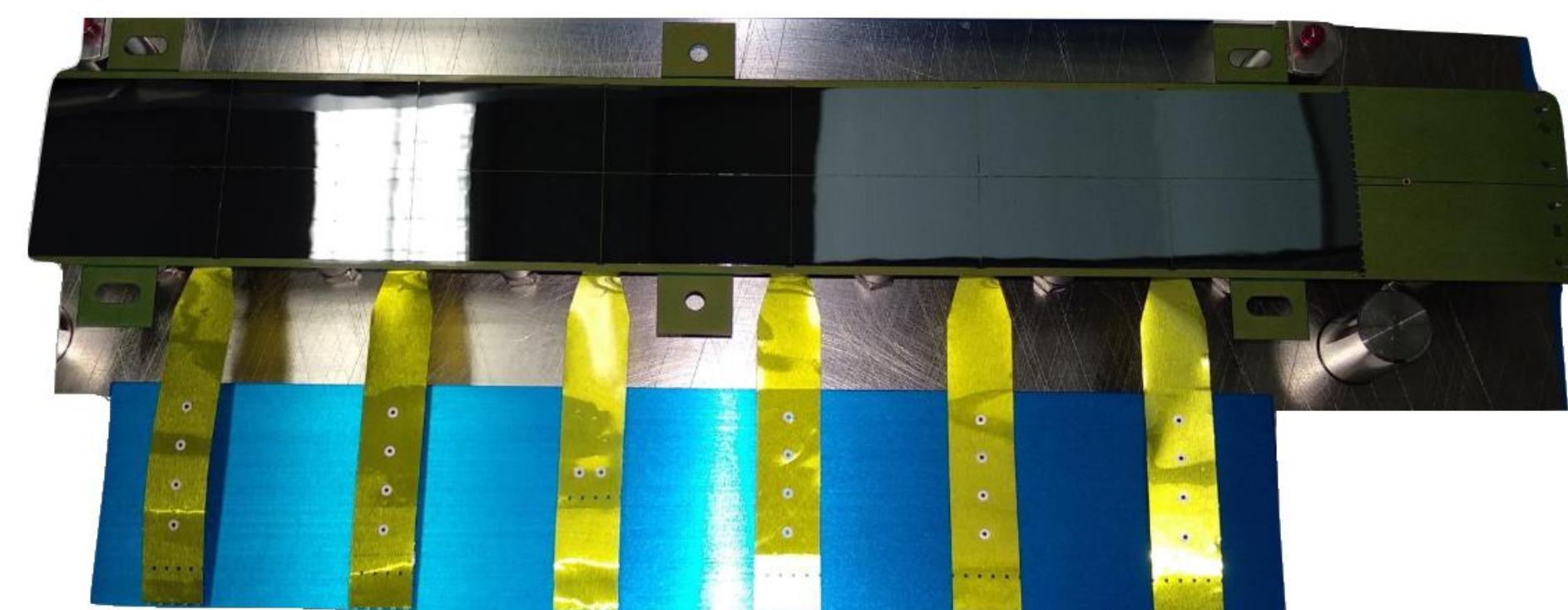# COLLABORATION PROJECT

CBM-BM@N STS
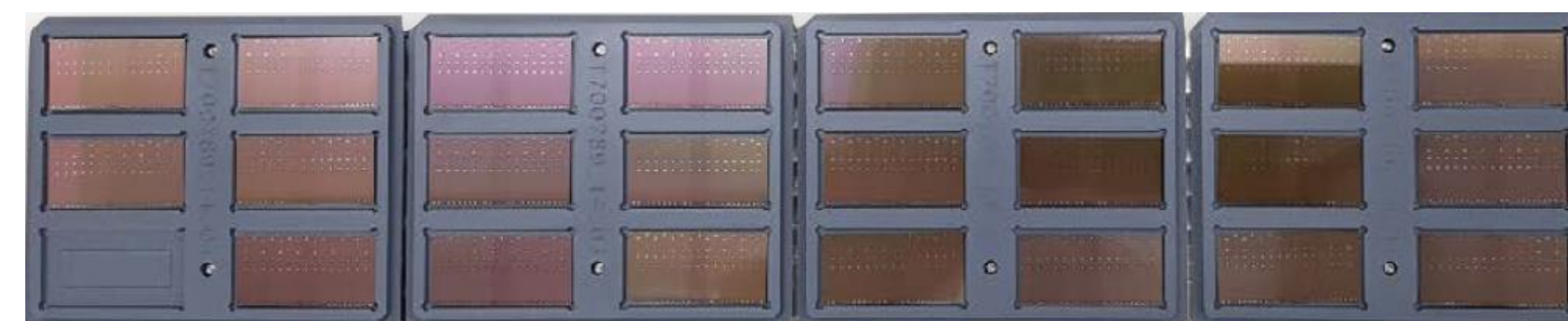# COLLABORATION PROJECT

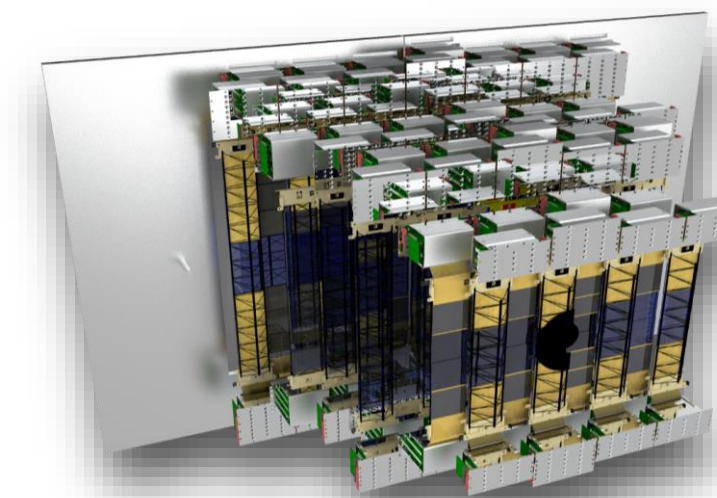# Only the Outer Barrel:

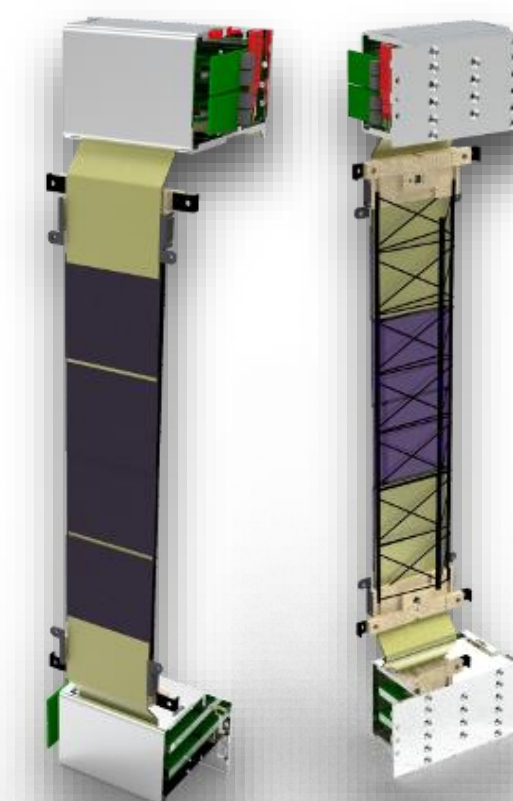☑ **4**2x – Staves

☑ **588x** - HIC

☑ **8232x** - MAPS

☑ **4**x - Stations

☑**44**x - Ladders

☑**292x** - Silicon strip modules.

Easing the human interaction with the DB: FPC-DB-Software

Custom-made GUI

(Total: 800 pcs)

FPC production

BOBFPC   **CC**

Testing

Soldering

OBFPC

Testing

Storage

CmisWebAPI

The following operations are supported. For a formal definition, please review

- ActivityAttachmentCreate
- ActivityAttachmentRemove
- ActivityChange
- ActivityComponentAssign
- ActivityComponentRemove
- ActivityCreate
- ActivityMemberAssign
- ActivityMemberChange
- ActivityMemberRemove
- ActivityParameterChange
- ActivityParameterCreate
- ActivityParameterRemove
- ActivityRead
- ActivityReadOne
- ActivityTypeRead
- ActivityTypeReadAll
- ActivityUriCreate
- ActivityUriRemove
- AttachmentCategoryRead
- ComponentActivityHistoryRead
- ComponentChange
- ComponentChildrenRead
- ComponentCompositionCreate
- ComponentCompositionPositionChange
- ComponentCompositionRemove
- ComponentCreate

X MPD-ITS FPC PRODUCTION

File   Blank OB FPC LOT   Blank OB FPC   Cross Cables   OB FPC   OB FPC BOXs   Help

MPD ITS - Manage FPC component (Courtesy of CERN-ALICE)   logged user : Ceballos Sanchez Cesar

Preset: Project = MPD-ITS Location = JINR, Dubna   Install EOS !   Renew Kerberos !

```
2021-09-06 09:33:41,418 - DEBUG : Login validate control type is 0
2021-09-06 09:33:41,418 - DEBUG : Login validate for the user:
2021-09-06 09:33:41,418 - DEBUG : Restore the last config...
2021-09-06 09:33:41,419 - DEBUG : Get the list of users defined...
2021-09-06 09:33:41,419 - DEBUG : 3sers defined!
2021-09-06 09:33:41,980 - DEBUG : DB User selection User -22 Fake User  Selected 341 Ceballos Sanchez Cesar
2021-09-06 09:33:42,027 - DEBUG : Projects list contains 15 items !
2021-09-06 09:33:42,036 - DEBUG : From project MPD-ITS get the id 181 !
2021-09-06 09:33:42,042 - DEBUG : Member list contains 5 items !
2021-09-06 09:33:42,043 - INFO : Enable GUI at level 9. Logged user : 'Ceballos Sanchez Cesar'
```

CMIS web interface

Activities: MPD-ITS

Total Records: 60

| Activity Name	Activity Type	Start Date	End Date	Location	Activity Status	Activity Result	
[430] OBFPC ElecticTest AL003479	[458] Outer Barrel FPC Electrical Test	09.09.2021	09.09.2021	[293] JINR, Dubna	[242] CLOSED	[586] OK	2
[429] BLOBFPCL CrossCableSolder A003479	[457] Outer Barrel FPC Cross Cable Soldering	09.09.2021	09.09.2021	[291] JINR, Dubna	[242] CLOSED	[583] OK	
[428] CROSSCBL AttachLotInfo CX011	[377] Cross Cable Lot Attach Information	09.09.2021	09.09.2021	[290] JINR, Dubna	[241] OPEN	[]	
[427] BLOBFPC ElectricalTest A003479	[368] Blank Outer Barrel FPC Electrical Test	09.09.2021	09.09.2021	[287] JINR, Dubna	[242] CLOSED	[572] OK	2
[426] BLOBFPC ElectricalTest A003479	[368] Blank Outer Barrel FPC Electrical Test	09.09.2021	09.09.2021	[287] JINR, Dubna	[242] CLOSED	[572] OK	
[425] BLOBFPC ElectricalTest A003479	[368] Blank Outer Barrel FPC Electrical Test	09.09.2021	09.09.2021	[287] JINR, Dubna	[242] CLOSED	[572] OK	1
[424] BLOBFPC Metrology A003479	[371] Blank Outer Barrel FPC Metrology	09.09.2021	09.09.2021	[285] JINR, Dubna	[242] CLOSED	[569] OK	
[423] BLOBFPC Metrology A003479	[371] Blank Outer Barrel FPC Metrology	09.09.2021	09.09.2021	[285] JINR, Dubna	[242] CLOSED	[569] OK	
[422] BLOBFPC VisInspect A003479	[373] Blank Outer Barrel FPC Visual Inspection	09.09.2021	09.09.2021	[286] JINR, Dubna	[242] CLOSED	[595] OK	
[421] BLOBFPC Metrology A003479	[371] Blank Outer Barrel FPC Metrology	09.09.2021	09.09.2021	[285] JINR, Dubna	[242] CLOSED	[569] OK	
[410] CROSSCBL AttachLotInfo CX013	[377] Cross Cable Lot Attach Information	03.09.2021	03.09.2021	[290] JINR, Dubna	[241] OPEN	[]	
[409] CROSSCBL AttachLotInfo CX015	[377] Cross Cable Lot Attach Information	03.09.2021	03.09.2021	[290] JINR, Dubna	[241] OPEN	[]	
[408] OBFPC ElecticTest AL002113	[458] Outer Barrel FPC Electrical Test	02.09.2021	02.09.2021	[293] JINR, Dubna	[242] CLOSED	[586] OK	
[407] CROSSCBL AttachLotInfo CX001	[377] Cross Cable Lot Attach Information	02.09.2021	02.09.2021	[290] JINR, Dubna	[241] OPEN	[]	1
[406] BLOBFPCL CrossCableSolder A003122	[457] Outer Barrel FPC Cross Cable Soldering	02.09.2021	02.09.2021	[291] JINR, Dubna	[242] CLOSED	[583] OK	
[405] BLOBFPCL CrossCableSolder A003546	[457] Outer Barrel FPC Cross Cable Soldering	31.08.2021	31.08.2021	[291] JINR, Dubna	[242] CLOSED	[583] OK	
[404] BLOBFPCL CrossCableSolder A003545	[457] Outer Barrel FPC Cross Cable Soldering	31.08.2021	31.08.2021	[291] JINR, Dubna	[242] CLOSED	[584] NOK	
[403] BLOBFPC ElectricalTest A003520	[368] Blank Outer Barrel FPC Electrical Test	31.08.2021	31.08.2021	[287] JINR, Dubna	[242] CLOSED	[573] NOK	
[402] BLOBFPC Metrology A003545	[371] Blank Outer Barrel FPC Metrology	31.08.2021	31.08.2021	[285] JINR, Dubna	[242] CLOSED	[570] NOK	
[401] OBFPC ElecticTest AL002112	[458] Outer Barrel FPC Electrical Test	29.08.2021	29.08.2021	[293] JINR, Dubna	[242] CLOSED	[586] OK	5

Workflow for assembling of BM@N-STS Modules
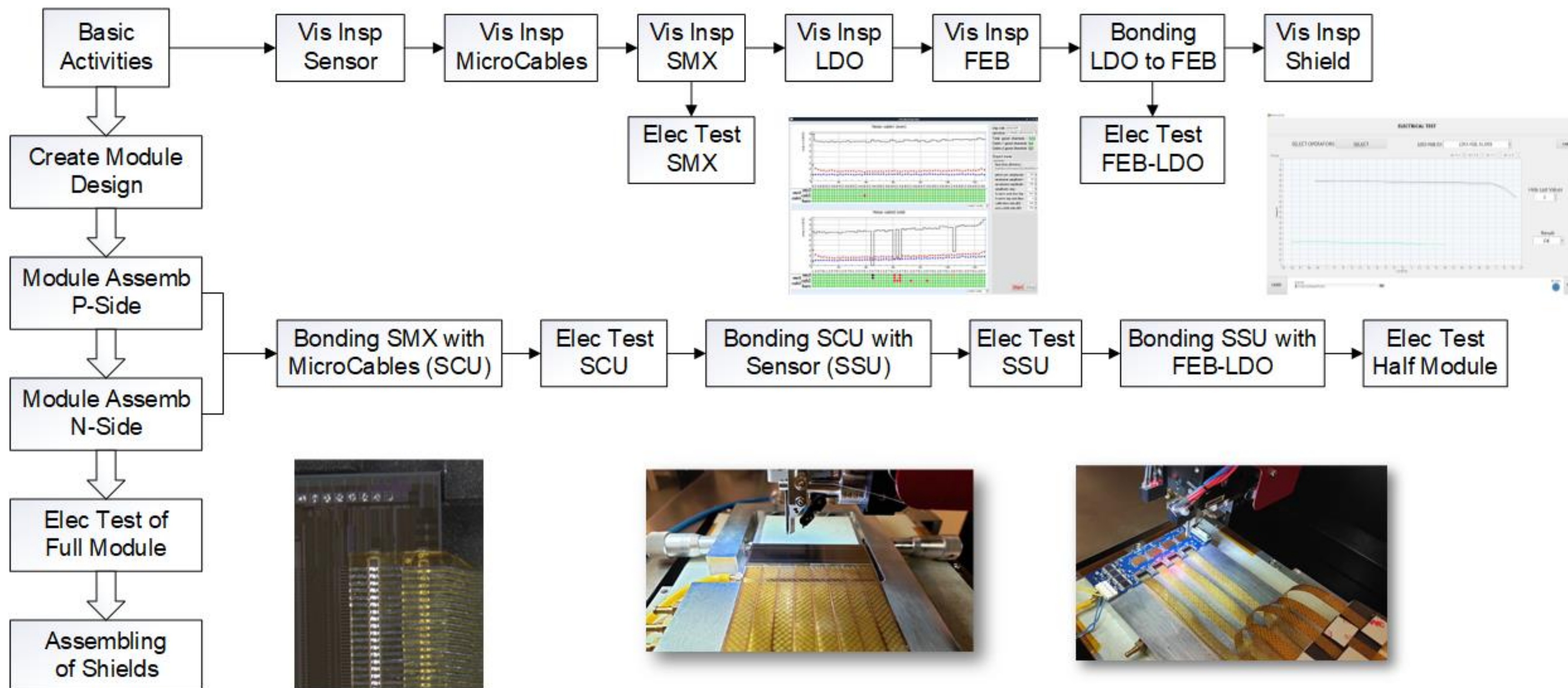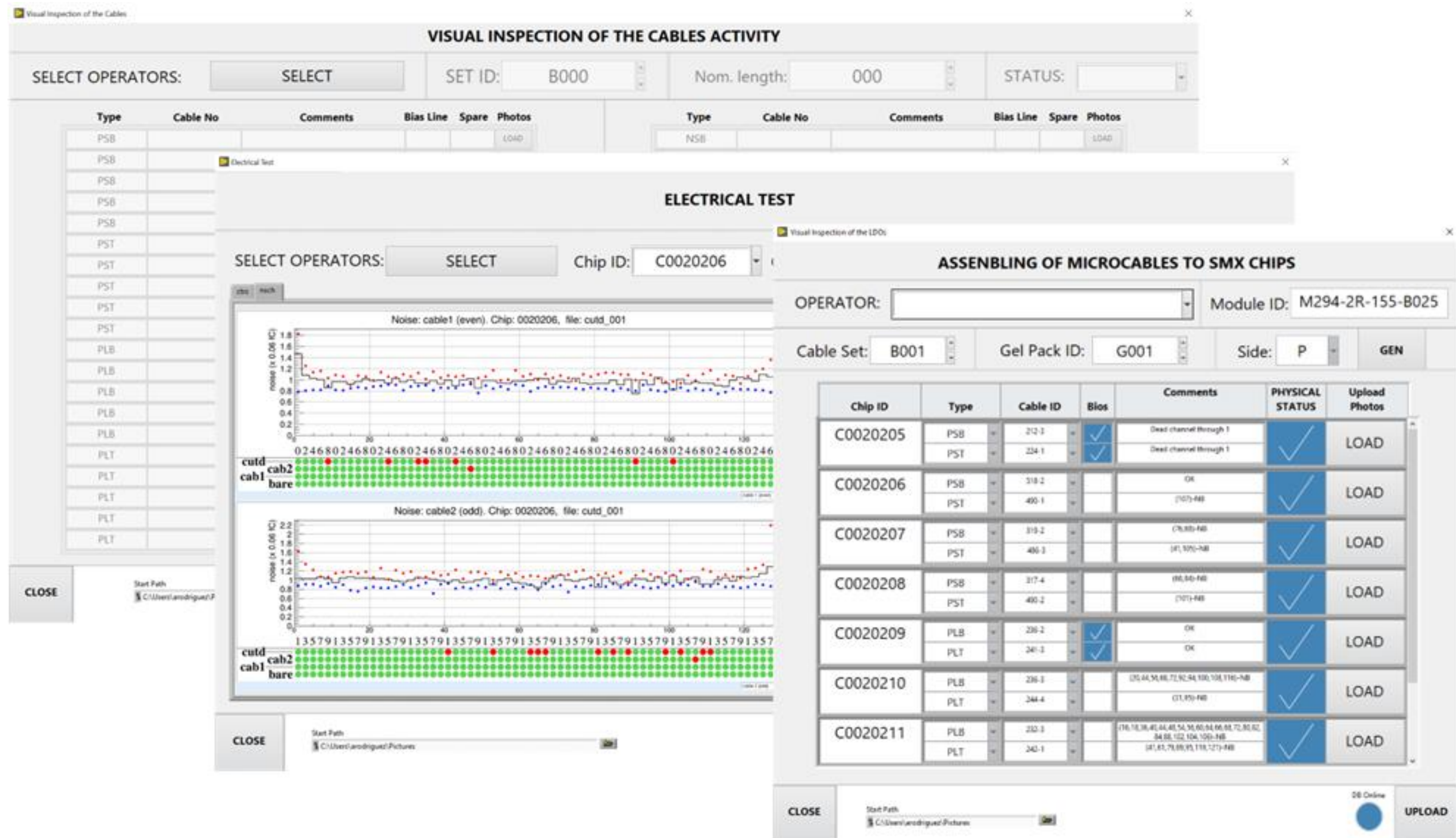
- ☑ **82**x - Visual Inspection of STS MST Sensor

- ☑ **3880**x - Visual Inspection of STS Microcable

- ☑ **207x** - Visual Inspection of STS SMX

- ☑ **27**x - Visual Inspection of STS FEB

- ☑ **76x** - Visual Inspection of STS LDO

- ☑ **120x** - Visual Inspection of STS Shield

- ☑ **198x** - Electrical Test of SMX

Conclusion

- The deployment of the CMIS on the JINR's infrastructure represent a novelty for this institute since no such a system had been used before.

- The system is particularly useful for the fine-grained control and continuous feedback of the production of complex multipart objects like the detectors subsystems composing the different experiments of the NICA facility at LHEP.

- Offer the possibility of creating a fully customized interfaces using any desired programming language to better adapt to the structure and requirements of any project of this type, using the web API collection.

- At present it is used by two of the NICA projects (MPD-ITS and BM@N-STS) but since it is centrally hosted at JIRN(LIT) it might be used by any other project that could benefit from it.

Thank you for your attention!